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# THE CORNELL READING COURSE FOR THE FARM

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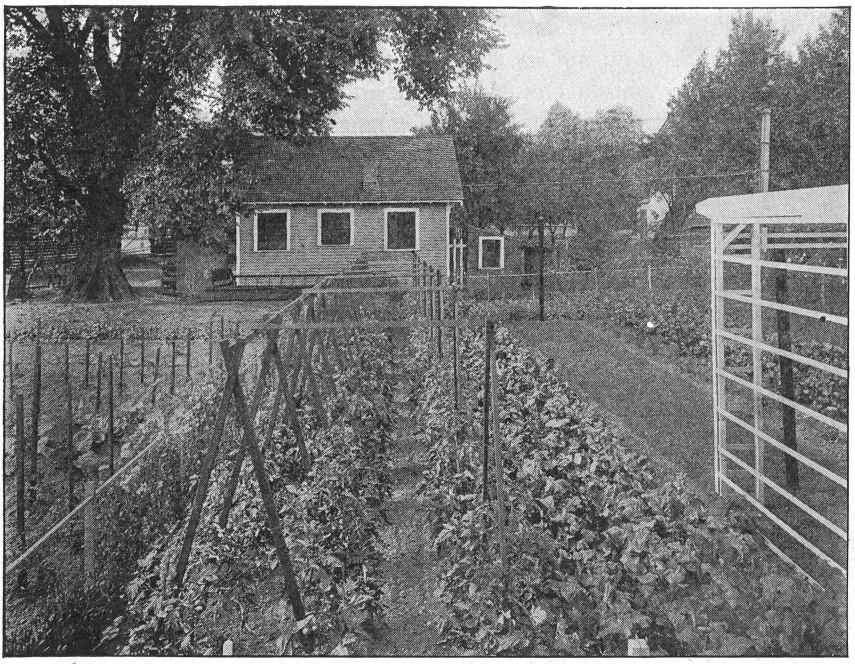
LESSON 145 VEGETABLE GARDENING SERIES MAY, 1919

# PLANNING THE HOME VEGETABLE GARDEN

# GROWING EARLY PLANTS

ROBERT BIER



A PRIZE-WINNING GARDEN, CONVENIENTLY LOCATED

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# THE CORNELL READING COURSE FOR THE FARM

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"No other human occupation opens so wide a field for the profitable and agreeable combination of labor with cultivated thought as agriculture."— ABRAHAM LINCOLN.

The increased area for world food production in 1919 indicates that the New York farmers should return to sound permanent systems of farming. The combination of cultivated thought with labor not only is agreeable but results in efficiency in farming, which makes profits possible when price levels are becoming lower. The State College of Agriculture offers lessons for home study free to residents of New York State. The reader may obtain consecutive instruction on the subjects in which he is interested, and also the new lessons as issued. The attached discussion paper gives further information.

The reading course lessons for the farm are elementary and brief, and are intended to arouse a desire for additional knowledge. Advanced reading courses in farm crops, fruit growing, and vegetable gardening, provide more complete instruction in accordance with modern correspondence methods. Reports on the reading and practical exercises are corrected, graded, and returned to the reader with suggestions from specialists. The only expense in each advanced reading course is the cost of a textbook and practice material.

The reading course lessons make useful material for educational programs in granges and other local organizations. In a number of communities groups have organized for the discussion and study of common problems, and have adopted the name *Cornell Study Club*. This may be done in connection with an existing organization or independently. Assistance is given in organizing and conducting Cornell study clubs.

Correspondence is a medium for the exchange of helpful information. Letters will receive careful attention.

# PLANNING THE HOME VEGETABLE GARDEN

A well-thought-out plan will go a long way toward making the home vegetable garden a success. Space can then be utilized to the best advantage, and seed, supplies, and equipment can be provided in advance of the planting season, thereby saving much time and confusion. The plan should be drawn on paper and should show where each vegetable is to be planted, the number of rows of each kind, and whether it is to be grown as an intercrop, a succession crop, or will occupy the ground during the whole season. So far as space will permit, the garden should furnish a supply of fresh vegetables for table use thruout the growing season, and a surplus for canning and storing. In making the plan the following points must be considered: size, location, and arrangement of the garden; kind of cultivation to be used; soil; crops and varieties, and their adaptation to local conditions.

## SIZE, LOCATION AND ARRANGEMENT

In the country, a vegetable garden from one-eighth to one-half acre in size should meet all demands for home use, the exact size depending on the number of persons in the family and the kind of cultivation to be given. A garden one-eighth acre in size if very productive and intensively cropped, should supply the average family with fresh vegetables thruout the growing season and with a surplus of the most important kinds for canning and storing. If one-fourth acre is available and is equally productive, the rows may be spaced farther apart and horse-drawn tools used in cultivating. It is seldom advisable to plant more than one-half acre in vegetables for home use, no matter how much ground is available. In the city, the size of the garden generally depends on the space available.

Soil and slope of the ground should be considered in locating a garden, but if possible it should be near the house. This is an advantage both in caring for the garden and in harvesting the crops. A garden is more likely to be neglected if it is far from the house. If the garden is to be near buildings, it should be on the south or the east side so that it can get the most sunlight and be protected from cold winds.

Many back yards in cities are shaded during the greater part of the day, and it is doubtful whether any vegetables can be grown to advantage on some of these plots. However, where sunlight may be expected for at least three hours a day, the leaf crops, such as lettuce and spinach, may be grown. Such crops as tomatoes, which mature fruits, require

at least five hours of sunlight each day. Where there is complete shade all day, it would be a waste of time to plant any vegetables.

The space allotted hotbeds and coldframes and to perennial crops, such as asparagus, rhubarb, horse-radish, and artichoke, should be at one end or along the side of the garden, in order to facilitate plowing and cultivation. If bush fruits and tree fruits are in the same garden, they should be placed on the west or the north, or in the direction of the prevailing winds, to serve as a windbreak.

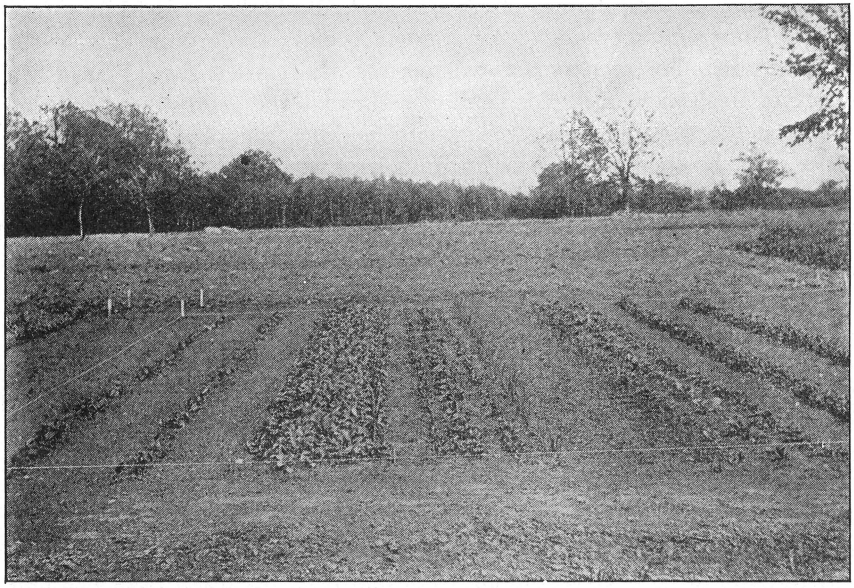

FIG. 103. A WELL-PLANNED GARDEN

This shows arrangement of the main season crops. Some of the early vegetables have been harvested and second plantings made

In general, the rows should run lengthwise, especially in the larger gardens, where horse cultivation is used. In small gardens, short rows may be more convenient. In any case the rows should run at right angles to the slope of the land if it is rolling or hilly. If the rows run east and west, the taller crops should be placed on the north side of the garden, in order to prevent them from shading the low-growing plants.

## KIND OF CULTIVATION

The kind of cultivation practiced will be determined by the size of the garden and the condition of the soil. Intensive gardening is not as practi-

cable on very stony or very rough ground as it is on a productive sandy loam. The comparative cost of hand and horse cultivation should be considered and the garden planned accordingly. In general, horse cultivation will be found more economical for the large garden on the farm, and hand cultivation more economical for the city garden where space is limited.

## TREATMENT OF GARDEN SOILS

Garden soils may be divided into clay loam, sand, gravel, or a combination of these. Loamy soils are usually the best, because they are friable and contain more organic material than sandy or gravelly soils. A good application of manure supplemented with commercial fertilizer will generally furnish sufficient plant food for a good crop.

Clay soils are usually wet and sticky, and require careful management. Applications of lime or sifted coal ashes aid in making clay soils more friable and open. The sifted coal ashes contain little or no plant food, but improve the texture of the soil. It is a good plan to test samples of the soil from various parts of the garden to see whether it is acid. The test is made by placing moistened soil in a cup or glass and inserting a piece of blue litmus paper into the soil. If the litmus paper becomes a decided pink in color, the soil is acid and requires lime to neutralize it. Acidity will be found in practically all garden soils to which no lime has been added for several years. An application of slaked lime at the rate of 4 pounds to 100 square feet will be found beneficial on lighter soils; heavier soil will require twice this amount.

Sandy soils are generally deficient in organic matter, but this condition can be remedied by the addition of manure or by turning under green crops. The gravelly soils are more deficient in organic matter and do not hold water for any great length of time. The addition of manure is needed to make this type of soil more productive and more retentive of moisture.

For early crops a light soil is best, while for late crops a heavier soil is preferable because it retains moisture better. If the garden contains more than one type of soil, these characteristics can be utilized to advantage in planting the crops.

More complete information about soils and their treatment is given in other publications of this College.[1]

[1]Introduction to the principles of soil fertility. Cornell Reading Course for the Farm, Lesson 74.
Nature, effects, and maintenance of humus in the soil. Cornell Reading Course for the Farm, Lesson 50.
Outline of the relation of the use of lime to the improvement of the soil. Cornell Extension Bulletin 5.

## MANURES AND FERTILIZERS

All plants need food, which is just another name for fertilizer. The plant absorbs the compounds it needs from the soil and carries them to the leaves where they are manufactured into foods that the plant uses in growth.

Stable manure is the best fertilizer for the garden, as it supplies both plant food and humus. The humus acts in a very complicated way, helping to hold water and to convert insoluble plant food in the soil into available form. Well-rotted manure may be spread on the garden after it is plowed; but if fresh manure is used, it should be applied in the fall or early spring and plowed under. For a garden 50 feet square, two 2-horse loads of manure would not be too much to apply. A soil that is well-manured does not bake or cake.

Stable manure, however, does not contain enough of the elements that the plant needs for growth, and generally loses some of these elements during handling. Manure is deficient in phosphorus, which may be supplied by applying with the manure 1 to 2 pounds of acid phosphate to 100 square feet of area.

Poultry manure may be used, but must not be applied too heavily. It is rich in nitrogen, and too heavy an application will cause an excess growth of tops and may even burn the plants. Poultry manure is especially valuable in leaf crops, such as spinach, lettuce, and celery; with tomatoes and beans it may produce foliage at the expense of fruit.

If manure is not obtainable, commercial fertilizers may be used. These fertilizers are said to be complete when they contain the three elements, nitrogen, phosphorus, and potassium.

Certain vegetables, particularly those crops grown for their foliage, such as cabbage, celery, and lettuce, require a soil rather richer in nitrogen. Vegetables grown for the fruit, such as tomatoes, require more phosphorus and potassium in proportion to nitrogen. A complete fertilizer analyzing 2 to 4 per cent nitrogen, 8 per cent phosphorus, and 4 per cent potash, ought to supply the needs of the average back-yard soils. The amount of fertilizer to apply will vary with the natural fertility of the soil, the previous treatment, and the crops to be grown. A pound for 50 square feet should bring desired results on most soils. No amount of commercial fertilizer, however, will make up for a deficiency of humus; in fact, large applications of commercial fertilizers are justified only on soils well-supplied with humus. When manure is not used the humus is usually supplied by turning under a soil-improving crop. Rye is the crop most generally used as it may be planted late in the season after the vegetables have been harvested.

## CROPS AND VARIETIES FOR THE HOME GARDEN

Generally too little attention is given to the needs and preferences of the family, when the garden is planned. Crops that are not relished should never be grown unless for trial or test. In many gardens there is too great a supply of lettuce and string beans and not enough of beets, carrots, and other vegetables. In studying vegetables to be planted, especially where the space is limited, the food[2] and the money values as well as the space required should be considered.

In a limited area, quick-maturing crops and those producing large yields in proportion to the space required should be planted, for example, tomatoes, eggplant, beans, lettuce, beets, carrots, parsnips, and onions. After early crops have been removed, other vegetables may be planted in the same space. For example, radishes, lettuce, onions, or early beets may be followed by string beans, late cabbage, or celery. In some locations the second crop may be followed by a fall crop of spinach, lettuce, or beets. In a small garden it would be unwise to plant such crops as potatoes, corn, and cucumbers. These crops require a large space in proportion to the food produced and are suitable only for a rather large garden.

No list of varieties could be given that would be best for every home garden in this State. This must be learned from neighbors and from experience. The list in this bulletin is only for the guidance of the beginner and includes the varieties that are grown most widely thruout the State.

ASPARAGUS

Palmetto, Giant Argenteuil, Reading Giant. (One- or two-year-old roots should be bought instead of growing plants from seed, as at least a year will be saved.)

BEAN

Dwarf, or bush

Green-podded: Stringless Greenpod, Refugee, 1000 to 1.

Wax-podded: Wardwell Wax, Golden Wax.

Dry shell: White Marrowfat, Red Kidney, and Boston Pea.

Lima

Bush: Henderson Bush Lima, Dreer Bush Lima, Burpee Bush Lima, and Forkhook Bush Lima.

Pole: Early Leviathan, King of the Garden.

Pole

Green-podded: Kentucky Wonder.

Wax-podded: Golden Cluster.

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[2] Information on the food value of various vegetables is given in *Short Cuts for the Home Dietitian*, Cornell Reading Course for the Farm Home, Lesson 112.

(In many sections of New York it is not advisable to plant pole beans; they require a longer season than do bush beans, and in addition must be staked.)

BEET

Early: Crosby Egyptian. (By making successive plantings this variety may be used for all purposes.)

Late: Detroit Dark Red, Blood Turnip.

BRUSSELS SPROUT

Long Island Improved.

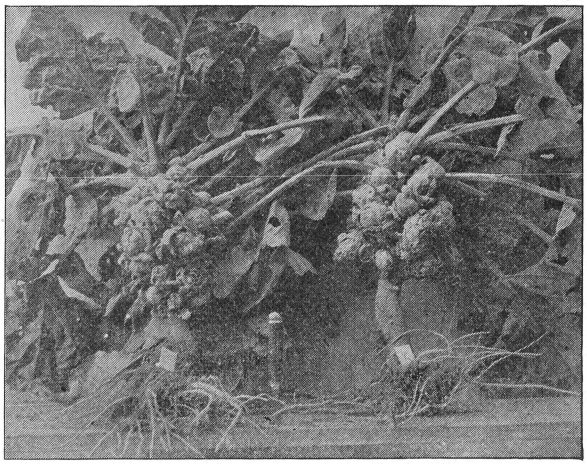


FIG. 104. BRUSSELS SPROUTS

CABBAGE

Early: Jersey Wakefield, Copenhagen Market, All Head Early.

Midseason: Glory of Enkhuizen, Succession.

Late: Danish Ball Head, Red: Red Rock, Red Dutch. (The red cabbages are slow maturing but are well adapted for making cold slaw.) Savoy: Drumhead Savoy. (The savoy cabbages are late maturing, with crumpled instead of smooth leaves. The plants are hardy but slow to head, and the heads are likely to be small and more or less loose. They have a superior flavor, however, especially after they have been touched with frost, and should be more grown in the home garden.)

CARROT

Early: Chantenay, Oxheart. (Oxheart is especially adapted to the heavier soils.)

Late: Danvers Half-long. (This variety is recommended for storing.)

CAULIFLOWER

Snowball, Dwarf Erfurt.

CELERY

Early: Golden Self-blanching. (This variety may also be used for the late crop.)

Late: Winter Queen.

CUCUMBER

For slicing: White Spine, Davis Perfect.

For pickling: Boston Pickling, Fordhook Pickling.

EGGPLANT

Black Beauty, New York Improved.

ENDIVE

White Curled, Green Curled, Broad Leaved Batavian.

KALE

Green Curled.

KOHL-RABI

White Vienna, Purple Vienna.

LEEK

American Flag.

LETTUCE

Head

Early spring: May King, Mignonette.

Summer: Salamander, Hanson.

Fall: Big Boston.

Loose leaf: Grand Rapids.

Cos, or Romaine: Paris White.

(May King and Grand Rapids are adapted to forcing in the hotbed, but are also grown in the garden.)

MUSKMELON

Salmon flesh: Osage or Millers Cream, Emerald Gem.

Green flesh: Netted Gem, Hackensack.

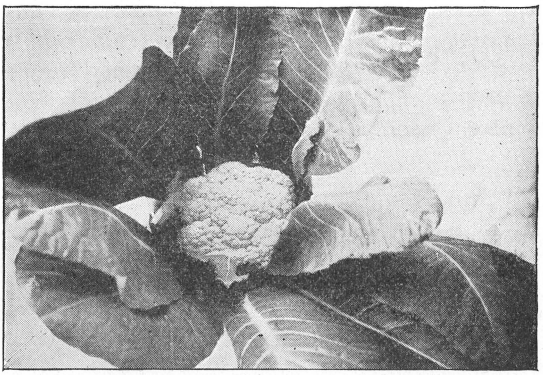
OKRA

Dwarf Green.

ONION

For mature bulbs: Globe Danvers, Southport, Red Weathersfield, Ailsa Crag, Prizetaker.

For green onions from sets: Silver Skin, White Portugal.



C. 105. AN ESPECIALLY FINE HEAD OF CAULIFLOWER

FIG. 106. A PLATE OF CRISP LETTUCE

PARSLEY

Moss Curled, Double Curled.

PARSNIP

Hollow Crown.

PEAS

Early

Dwarf: Nott's Excelsior, American Wonder.

Half dwarf: Thomas Laxton, Gradus

Late

Dwarf: Stratagem.

Half dwarf: Advance.

Tall: Telephone.

(Dwarf, under 2 feet; half dwarf, 2 to 4 feet; tall, over 4 feet. These measurements apply only to plants grown in average soil; richer soils will naturally produce larger vines.)

PEPPER

Sweet (for stuffing or salad): Chinese Giant, Bull Nose, Ruby King.

Hot (for seasoning): Cayenne, Red Chili.

(The sweet and the hot peppers should not be grown together because they cross.)

POTATO

Early: Irish Cobbler, Early Rose.

Late: Green Mountain, Rural New-Yorker.

PUMPKIN

Sweet Sugar or Small Sugar.

RADISH

Early: Scarlet Globe (round red), White Icicle (long white), French Breakfast (cylindrical red with white tip).

Summer: White Strassburg (long white).

Winter: White Chinese or Celestial, Black Spanish.

RHUBARB

Victoria, Linnaeus. (Roots should be bought, because plants raised from seeds are variable.)

SALSIFY

Sandwich Island.

SPINACH

Savoy, or Bloomsdale; Long Standing; Viroflay. (New Zealand spinach may be grown for summer, as it will stand hot weather.)

SQUASH

Early: Crookneck, White Bush.

Late: Hubbard, Delicious.

SWEET CORN

Early: Golden Bantam (yellow), Cory (white).

Midseason: Metropolitan (white), Seymour's Sweet Orange (yellow) Black Mexican (bluish black).

Late: Evergreen (white), Country Gentleman (white).

(Early varieties may be planted every ten days to the first of July for a succession).

SWISS CHARD

Lucullus.

TOMATO

Early

Red: Bonny Best, John Baer, Chalk's Early Jewel.

Pink: June Pink.

Midseason

Pink: Livingston Globe.

Late

Pink: Ponderosa.

Red: Stone.

TURNIP

White Milan, Purple Milan, Rutabaga or Swedish turnip, Improved American.

WATERMELON

Coles Early.

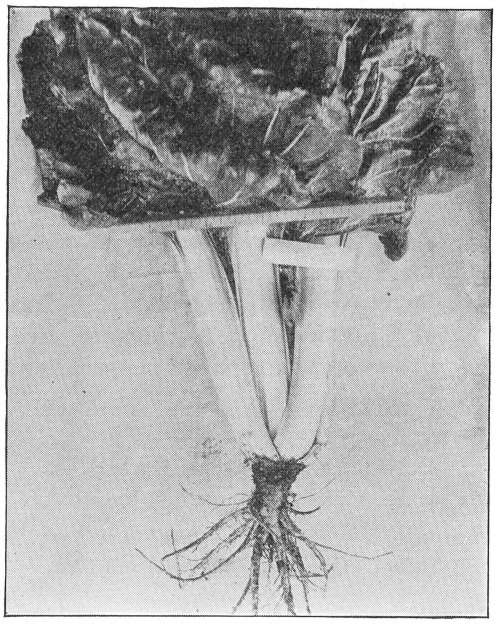


FIG. 107. SWISS CHARD

## SUCCESSION AND ROTATION OF VEGETABLE CROPS

When the growth habits of vegetables are known, the gardener may practice intercropping by planting quick-maturing crops of small size between those that are slow and require a large space in which to develop. Lettuce, radishes, and beets may be planted between such crops as cabbage or tomatoes.

Some vegetables require only a part of the season for their growth and may be followed by others. Early peas or early cabbage, for example, may be followed by late celery or late beets. This is called succession cropping. Full utilization of the garden is possible only where succession cropping is followed. Therefore the gardener should consider this factor in making his garden plan.

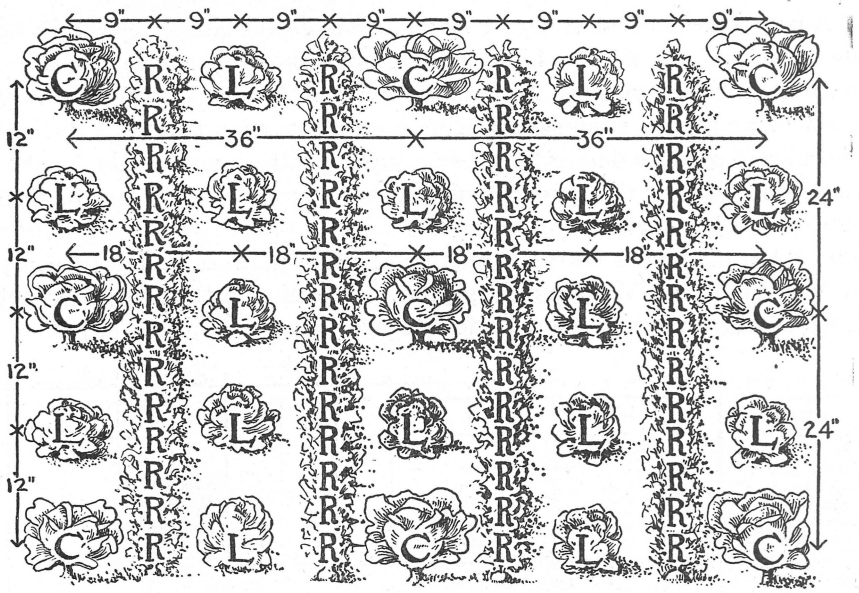



FIG. 108. A METHOD OF INTERCROPPING

All these crops are planted at the same time. The lettuce (L) and the radishes (R) mature before they are crowded by the cabbage (C)

The following lists of vegetables (table 1) arranged according to the time they occupy the ground, may be suggestive in working out plans for intercropping and succession cropping. Conditions of course will vary with climate and location. Long Island gardeners, for example, will have a greater range of combinations than gardeners in sections where the growing season is comparatively short.

TABLE 1. GROUPING OF CROPS

| Crops that occupy the ground the entire season | Early crops that may be followed by others | Late crops that may follow others |
|---|---|---|
| Beans, lima (both bush and pole) | Beans, bush | Beans |
| Corn, late | Beets, early | Beets |
| Cucumbers | Cabbage, early | Cabbage, late |
| Eggplant | Carrots, early | Carrots |
| Melons | Corn, early | Cauliflower |
| Onions from seed | Lettuce | Celery |
| Parsnips | Peas | Corn |
| Peppers | Potatoes, early | Kale |
| Potatoes, main crop | Radishes | Lettuce |
| Pumpkins | Spinach | Peas |
| Salsify | Turnips | Spinach |
| Squash | | Turnips |
| Tomatoes | | |

A harvest record indicating the dates on which vegetables were available for table use will aid in planning the garden for another year, so as to have a continuous supply thruout the season. Such a record of a very good home garden is shown in figure 109. This record shows a distinct shortage of produce during May, early June, and the latter part of August, but by replanning the garden probably more produce could be provided during the latter part of August in a normal year. With the addition of a coldframe and a hotbed, something besides radishes should be ready to harvest during May and early June. In this case the space was not large enough to grow vegetables for storage.

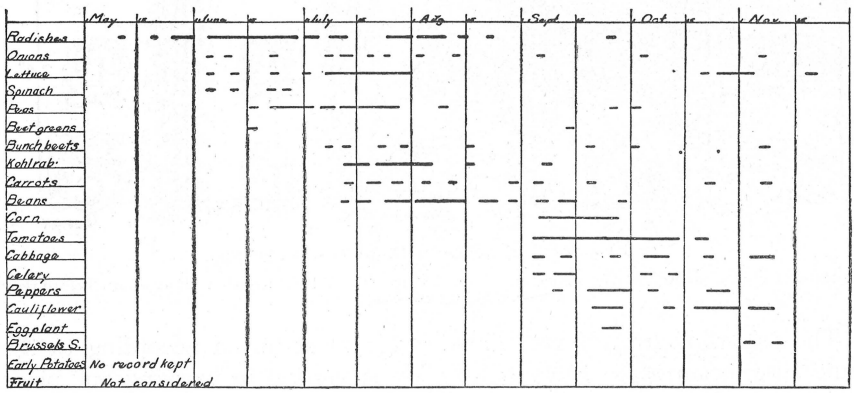



FIG. 109. A HARVEST RECORD

This shows the time the various vegetables were harvested from a garden 40x40 feet

## SEED

The home gardener cannot afford to buy cheap seed. It is a good plan to order seed from catalogs of firms that gardeners in your community have found reliable. Many of the firms specialize in some particular vegetable — for instance, one has a good type of lettuce, another of squash, and another of tomato — and gardeners should take advantage of this fact. As a general rule only new seed should be used, but often left-over seed may give satisfactory results. The latter, however, should be tested, and if the germination is low should be discarded.

### SEED TESTING

Testing seed before planting in the garden may often prevent disappointments later. Also by testing, the gardener learns what percentage of seeds will grow, which aids him in sowing. If germination is very poor, it is best to buy new seed. Of the smaller kinds, such as lettuce, 25 seeds

are generally tested, and 10 of the larger kinds, such as beans. Various homemade devices may be used for testing seeds; the plate and the glass tumbler germinator are both good.

The plate germinator is made as follows from two pie tins or dinner plates and some absorbent material, such as blotting paper, coarse wrapping paper, or cloth. In the bottom of one of the tins or plates, place several layers of the absorbent material, wet it thoroly, and scatter on it the seeds to be germinated. If plenty of absorbent is used, it will not be necessary to place a paper or a cloth over the seeds. Invert the second plate over the first as a cover, and fit the edges closely in order to make a tight, moist chamber. Keep the germinator in a room in which the temperature is 60 to 70°.

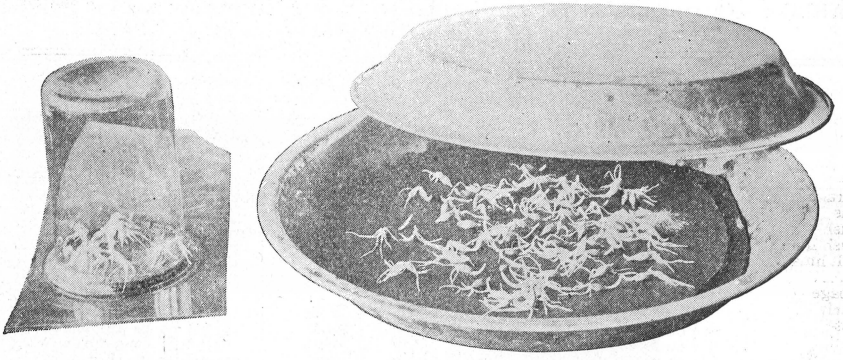


FIG. 110. TWO TYPES OF HOMEMADE SEED GERMINATORS

For small seeds, such as lettuce, an ideal germinator can be made as follows with a piece of glass, a glass tumbler, and some blotting paper. Cut two pieces of blotting paper so that they will just fit inside the tumbler. Lay these on top of each other on the piece of glass, wet them thoroly, and scatter on the top of the blotting paper the seeds to be germinated. Invert the tumbler over the blotting paper, and set the germinator in a warm place. As a rule no more water is needed, but if the blotting paper becomes dry, a little can be added. This type of germinator interests children because they can watch the germination as it progresses from day to day.

The seeds should be examined frequently and those that have sprouted should be taken out and counted. Any lot of seed which shows a low percentage of germination, at any given time, should be discarded, as slow sprouting indicates low vitality. A larger per cent of seed will sprout in the germinator than will produce plants in the garden.

## AMOUNT OF SEED REQUIRED

Before ordering seeds or plants for the garden it is important to consider the size of the garden, the number of persons to be supplied, the methods of planting, and the kind of cultivation to be given. Most inexperienced gardeners order and plant more seed than is needed. This results not only in a waste of seed but also in extra labor of thinning, or else growth is seriously checked by crowding of the plants in the row. In table 2 is given the approximate amount of seed or number of plants necessary to supply a family of four with vegetables of various kinds; the amount of seeds, or number of plants required for 100 feet of row; and also suggestions regarding the distance of planting for both hand and horse cultivation.

TABLE 2. QUANTITY OF SEED AND NUMBER OF PLANTS NECESSARY FOR 100 FEET OF ROW, DEPTH OF PLANTING, AND DISTANCE OF PLANTING

| Crop | Approximate quantity of seed required for family of four | Required for 100 feet of row | | Distance between rows (feet) | | Distance between plants in the row |
|---|---|---|---|---|---|---|
| | | Seed | Plants | Hand cultivation | Horse cultivation | |
| Asparagus | ..... | 1 ounce | 60–80 | 2 | 3–4 | 12–15 inches |
| Beans | | | | | | |
| Bush | 1–2 quarts | 1 pint | ..... | 2 | 2½–3 | 3–4 inches |
| Bush lima | 1 pint | ½–1 pint | ..... | 2½ | 3 | 6–10 inches |
| Poll lima | 1 pint | ½ pint | ..... | 3 | 4 | 3–4 feet |
| Beet | 4 ounces | 2 ounces | ..... | 1–1½ | 2–2½ | 3–5 inches |
| Cabbage | | | | | | |
| Early | 1 packet | 1 packet | 65–90 | 2–2½ | 2½–3 | 14–18 inches |
| Late | ½ ounce | ½ ounce | 65–90 | 2–3 | 2½–3 | 14–18 inches |
| Carrot | 1 ounce | 1 ounce | ..... | 1–1½ | 2–2½ | 2–3 inches |
| Cauliflower | 1 packet | ⅛ ounce | 60–75 | 2–2½ | 2½–3 | 15–18 inches |
| Chard | 1 ounce | 1 ounce | ..... | 1½–2 | 2½–3 | 6–10 inches |
| Celery | 1 packet | ⅛ ounce | 200–250 | 1½–2 | 3–4 | 4–6 inches |
| Corn, sweet | 1–2 pints | ¼ pint | ..... | 2½–3 | 3–3½ | 10–12 inches |
| Cucumber | ½ ounce | ½ ounce | 50–70 | 4–5 | 4–5 | Drills, 18 inches<br>Hills, 5 feet |
| Eggplant | 1 packet | ¼ ounce | 50–70 | 2–3 | 3 | 1½–2 feet |
| Kale | 2 ounces | ½ ounce | ..... | 1½–2 | 2½–3 | 8–10 inches |
| Lettuce | ½ ounce | ½ ounce | 125–200 | 1–1½ | 2–2½ | 6–10 inches |
| Muskmelon | ½ ounce | ½ ounce | 50 | 5–6 | 5–6 | Drills, 2 feet<br>Hills, 5 feet |
| Onion | | | | | | |
| Seed | ..... | 1 ounce | ..... | 1–1¼ | 2 | 3–4 inches |
| Sets | 4–6 quarts | 2 quarts | ..... | 1–1¼ | 2 | 3–4 inches |
| Parsley | 1 packet | ¼ ounce | ..... | 1–1¼ | 2 | 3–4 inches |
| Parsnip | ½ ounce | ½ ounce | ..... | 1¼–1½ | 2–2½ | 3–4 inches |
| Peas | 2-4 quarts | 1–2 pints | ..... | 2–3 | 3–4 | 1 inch |
| Pepper | ..... | 1 packet | 50–70 | 2–3 | 3–3½ | 1½–2 feet |
| Potato | ..... | 5–6 pounds | ..... | 2½–3 | 2½–3½ | 12–18 inches |
| Radish | 1 ounce | 1 ounce | ..... | 1–1¼ | 2 | 1 inch |
| Rhubarb | ..... .... | ..... | 30–50 | 2–3 | 3 | 2–3 feet |
| Salsify | 1 ounce | 1 ounce | ..... | 1–1½ | 2 | 2–3 inches |
| Spinach | ½ pound | 1 ounce | ..... | 1–1½ | 2 | 2–4 inches |
| Squash | | | | | | |
| Bush | ½ ounce | ½ ounce | ..... | 3–4 | 3–4 | Drills, 15–18 inches<br>Hills, 4 feet |
| Vine | ½ ounce | ½ ounce | ..... | 8 | 8 | Hills, 8 feet |
| Tomato | | | | | | |
| Early | 1 packet | ⅛ ounce | 35–50 | 2–3 | 3–4 | 2–3 feet |
| Late | ¼ ounce | ⅛ ounce | 35–50 | 2–3 | 3–4 | 2–3 feet |
| Turnip | 2–3 ounces | ½ ounce | ..... | 1–1½ | 2 | 3 inches |
| Watermelon | 1 ounce | 1 ounce | 30–35 | 8–10 | 8–10 | Drills, 3 feet<br>Hills, 8 feet |

### GARDEN TOOLS

Only the better grade of garden tools should be bought. Light, cheap tools usually break when put to hard service. In the average home garden, a spade, a hoe, a rake, and a line are essential. Other tools that are desirable and may be added as the gardener needs them are: shovel, wheel hoe, wheelbarrow, trowel, watering can or hose, spray outfit, hand weeder, and spading fork.

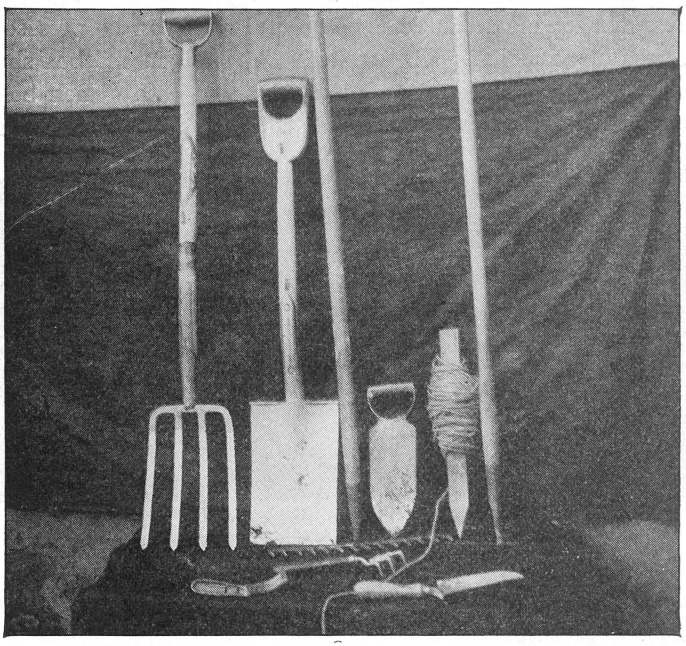


FIG. 111. GARDEN TOOLS

Spading fork, flat trowel, and weeders are useful but not essential. The spade, rake, line and hoe are essential

## GROWING EARLY PLANTS

Many home gardeners buy their plants of early lettuce, cabbage, tomatoes, early celery, and peppers from local growers or merchants. These plants may be grown at home, however, in the house in boxes or in a hotbed or a coldframe, if the gardener is willing to give attention to details.

### BOXES

Boxes from $2\frac{1}{2}$ to 3 inches deep are best for growing most young plants (fig. 112), and may be made at home from other boxes or from odds and ends of lumber. Drainage is usually provided for by making the

bottom of the box of slats, spaced from $\frac{1}{8}$ to $\frac{3}{16}$ of an inch apart. As a further provision for drainage a layer of coarse soil should be placed in the bottom of the box. A sheet of newspaper placed on the slats before the soil is put in, will prevent it from falling thru the cracks and at the same time will allow surplus water to escape.

For filling the box, good, moist, friable garden soil containing a large proportion of coarse sand should be used. If necessary the soil should be moistened some time before filling the box. Soil is of the proper moisture content for sowing seeds when a handful of it can be pressed into a ball that crumbles readily when touched. The soil in the box should be firmed, and the surface should be level and from $\frac{1}{4}$ to $\frac{1}{2}$ inch below the top of the box. If small seeds, such as those of celery and lettuce, are

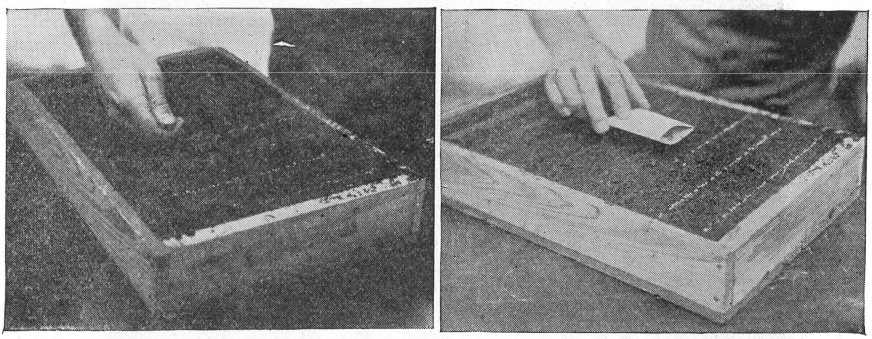


FIG. 112. TWO METHODS OF SOWING SEED

to be sown, it is well to screen the top half inch of soil thru a sieve of $\frac{1}{4}$-inch mesh.

The seed may be sown either in drills or broadcast. The latter can be done more rapidly, but drilling is generally preferred, for the soil between the rows may be stirred, and the plants are usually more stocky and are more easily removed for transplanting. For drilling, the box should be marked off into furrows about 2 inches apart and of the following depth for the various seeds: tomato, $\frac{1}{8}$ to $\frac{1}{4}$ inch; onion, $\frac{1}{4}$ inch; pepper and egg-plant, $\frac{1}{8}$ to $\frac{1}{4}$ inch; cabbage, cauliflower, brussels sprouts, kohl-rabi, $\frac{1}{4}$ inch; lettuce, $\frac{1}{8}$ inch; celery, barely covered with soil or covered with moist cheesecloth.

After the seeds are planted, the box should be heavily watered with a fine spray until all the soil is thoroly moist. It is a good plan to dig down to the bottom of the box and see whether enough water has been applied. Oftentimes the top layer may be soaked, while the bottom remains dry.

Most beginners and some experienced gardeners have more trouble in watering properly than in any other operation in growing young plants.

The box should be placed near a south or southeast window in a room in which the temperature is best suited for the kind of plant that is being grown. Onions, cabbage, cauliflower, brussels sprouts, kohl-rabi, celery, and lettuce grow best in a temperature of from 40° to 50° F. at night, and from 55° to 65° F. during the day. Tomatoes, peppers, and eggplant grow best in a temperature of from 65° to 68° F. at night and 70° to 80° F. during the day.

The box should be turned each day as soon as the plants appear; otherwise they will grow unevenly and become spindling. In order to grow, plants must have light, air, water, and plant food; therefore the seedlings should receive as much sunlight as possible and the soil between them should be stirred frequently so that water will soak in readily. Watering in early morning gives the surface of the soil and the plants opportunity to dry off during the day. A watering can with a fine rose is best for use with young plants.

## HOTBEDS AND COLDFRAMES

Only a rather limited number of plants can be grown in the house in boxes, but if a hotbed and a coldframe are available a greater variety of crops may be produced. Also some quick-maturing crops, such as early onions, radishes, and lettuce. A two-sash hotbed is ample for starting plants for the medium-sized garden, and a coldframe of equal size will be found convenient. If crops are grown to maturity in the frames, more space will be required.

If possible, hotbeds and coldframes should have a southern exposure and should be protected from prevailing winds by a house, a hedge, or some other windbreak.

The standard hotbed sash is 3 feet wide and 6 feet long, altho other sizes may be bought. Sash may be either single or double glazed, depending on whether they have one or two layers of glass. Single-glazed sash, the more common kind, are lighter to handle, cheaper, and easier to keep clean, than the doubled-glazed; the latter, however, have the advantage of furnishing better protection in cold weather. For protection at night, straw mats or old pieces of carpet may be laid over the sash. Sash covering of lath is sometimes used to shade the beds on sunny days.

There are three methods of heating hotbeds: by the use of fermenting manure, by hot water and steam, and by hot-air flues. The last two methods are used only in commercial gardening on a large scale. For

the small market garden and the home garden, the manure-heated bed is the most practicable and the most easily constructed. A cross section of such a hotbed in which the manure is placed below the surface of the ground, is shown in figure 114. When the bed is constructed in this form, it is called a permanent hotbed; when the manure is placed on top of the ground and the frame for supporting the sash set on this, it is known as a temporary hotbed.

For making the permanent hotbed the first operation is digging the pit from 24 to 36 inches deep, 6 feet long north and south, and as wide east and west as required by the number of sash used. If one sash is used, the pit would be 6 feet north and south and 3 feet east and west; if four sash are used, the pit would be 6 feet north and south and 12 feet east and west.

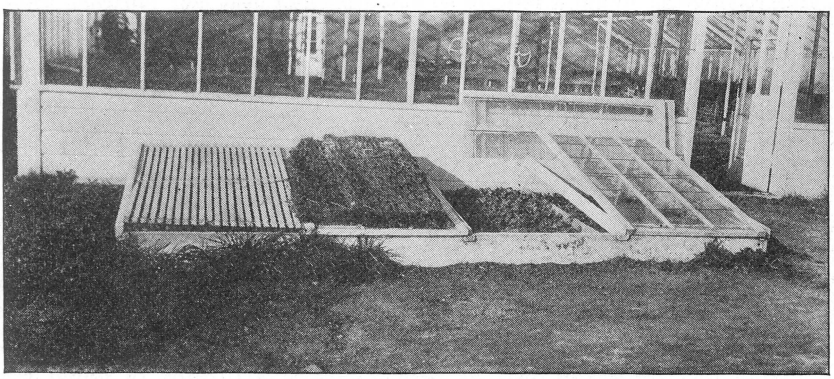


FIG. 113. A FOUR-SASH HOTBED

After the pit has been dug, a stake of 2x4-inch lumber should be driven at each corner, and, in the case of a long range of beds, at intervals of 6 feet along each side. The top of the posts on the south side of the bed should be 6 inches below the top of those on the north side, so that the sash will have a fall of 6 inches. The pit should be lined with two thicknesses of 1-inch boards, closely fitted without openings or holes that would admit cold air. As a support and brace, the top piece of lining should be of 2x6-inch lumber. Concrete instead of lumber may be used for lining the pit and is of course more durable. A concrete bed, however, requires more manure to heat it than does one lined with wood.

As soon as the pit is lined, it is ready to be filled. Layers of fresh horse manure that contains about half straw and that has been brought to a uniform temperature by being turned over a few times, should be put in until the pit is filled to within 4 inches of the surface of the soil on the outside. Each layer should be tramped down and well firmed, especially

in the corners and along the sides. On top of the manure should be placed 4 to 6 inches of rich, friable, garden loam. The surface of this soil should be 6 inches below the top of the frame on the south and 12 inches below the top of the frame on the north. For the first few days after the manure has been placed in the hotbed the temperature will be very high, and not until it has dropped to between 85° and 90° F. and become steady should any seeds be planted. During this time the bed should be ventilated in order to permit the escape of gases generated by the fermenting manure.

For the temporary hotbed, the manure is piled on top of the ground instead of being placed in a pit. The frame for supporting the sash,

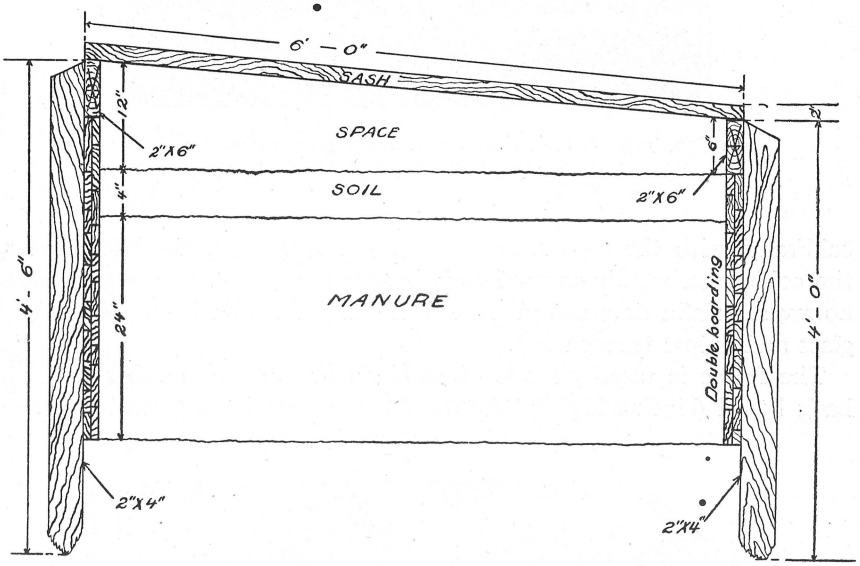



FIG. 114. CROSS SECTION OF A MANURE-HEATED HOTBED

which should be 12 inches deep on the south side and 18 inches deep on the north, is placed on the manure, and garden soil is added as in the case of the permanent bed. The frame should be banked all around with manure to keep out cold air and to keep in the heat that is generated by the manure.

The seed may be planted in boxes as already described (page 294) and these placed in the hotbed, or it may be sown directly in the hotbed soil. In the latter case, the rows should be from 3 to 6 inches apart, depending on the kind of vegetable and the time the plants are to remain in the bed.

In general, seeds should be sown in the hotbed from 6 to 12 weeks before the plants can be set out of doors. A guide for the date of planting vegetable seed under glass and the optimum temperature for the hotbed

on cloudy days is given in table 3. When the sun is shining, the temperature will rise accordingly. During the day the temperature should be kept 10° higher than that given in the table.

The construction of the coldframe is similar to that of the hotbed except that no means of heating is provided. The frame for a two-sash

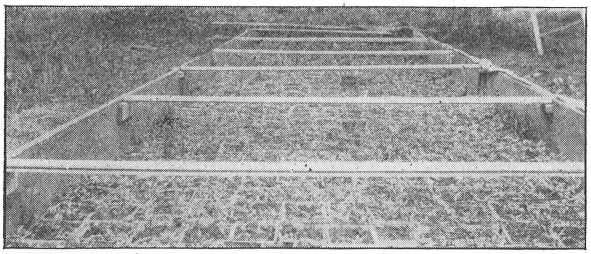


FIG. 115. COLD FRAMES ARE USED FOR HARDENING-OFF EARLY PLANTS AND FOR GROWING A FEW EARLY CROPS TO MATURITY

coldframe with the sash removed is shown in figure 116. For covering the coldframe, muslin-covered sash is sometimes used in place of glass; however, muslin does not provide so much protection from cold as does glass and is less transparent.

The frame is usually made of 2x6-inch or 2x8-inch lumber with the back board 6 inches higher than the front so that the sash will slope. If

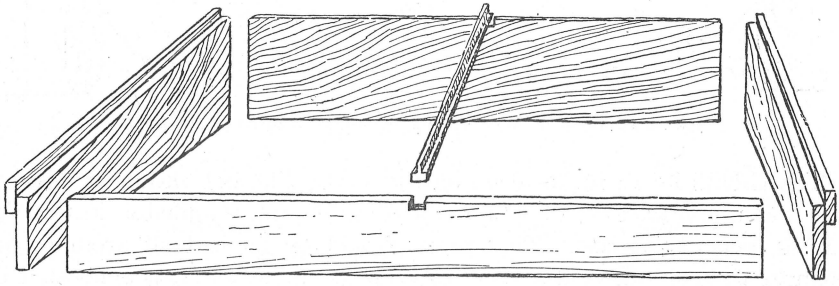


FIG. 116. A TWO-SASH COLDFRAME SHOWING DETAILS OF CONSTRUCTION

two or more glass sash are used, supporting bars, or crossties, should be placed every 3 feet apart (fig. 115). If the frame is to be covered with muslin, these bars may be farther apart and the muslin unrolled over the entire frame, or the muslin may be tacked on light frames 3x6 feet in size and handled in the same way as glass sash. The outside of the frame may be banked with straw or manure.

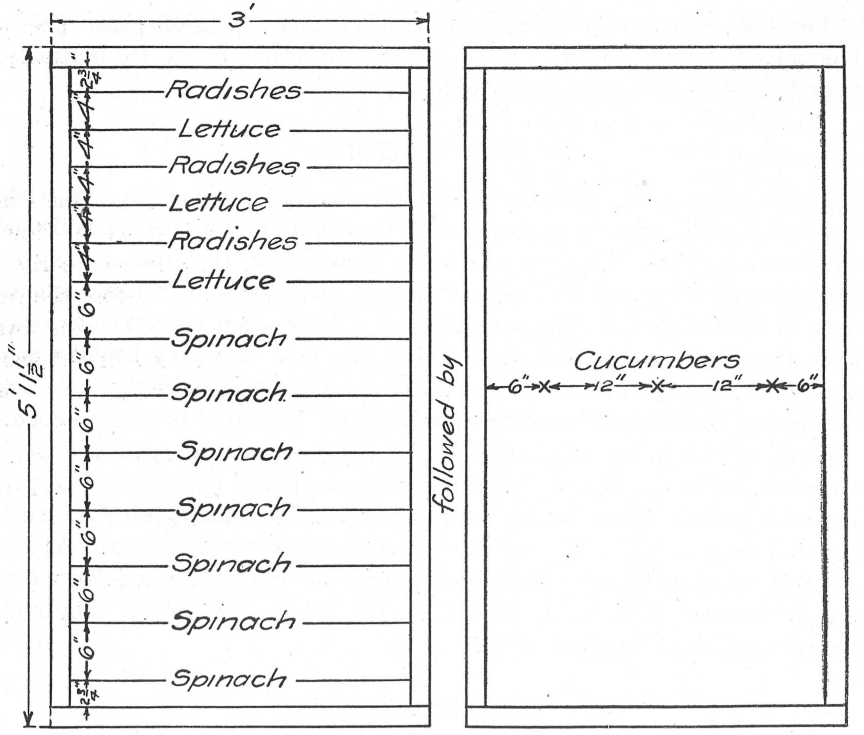



FIG. 117. A GOOD PLAN FOR A ONE-SASH BED WHERE VEGETABLES ARE TO BE RAISED FOR IMMEDIATE CONSUMPTION

TABLE 3. SEEDS SOWN UNDER GLASS

| Vegetable | Date to sow | Approximate temperature (degrees F.) | Number of days required to germinate |
|---|---|---|---|
| Beet | March 15 to April 1 | 55° | 7 to 10 |
| Brussels sprout | March 1 to April 1 | 55° | 3 to 7 |
| Cabbage | March 1 to April 1 | 55° | 3 to 7 |
| Cauliflower | March 1 to April 1 | 55° | 3 to 7 |
| Celery | March 15 to April 15 | 50° | 10 to 25 |
| Cucumber | March 15 to May 1 | 75° | 5 to 10 |
| Eggplant | March 1 to April 1 | 75° | 7 to 14 |
| Kohl-rabi | March 1 to April 1 | 55° | 3 to 6 |
| Lettuce | February 15 to April 1 | 55° | 3 to 6 |
| Muskmelon | April 15 to May 1 | 75° | 5 to 10 |
| Onion | January 15 to March 15 | 50° | 7 to 15 |
| Pepper | March 1 to April 15 | 75° | 7 to 12 |
| Squash | March 15 to April 15 | 75° | 5 to 10 |
| Tomato | March 1 to April 15 | 75° | 5 to 10 |
| Watermelon | April 1 to May 1 | 75° | 5 to 10 |

The most common use of the coldframe is for hardening-off plants grown indoors or in the hotbed. If it is used to grow crops to maturity, very fine rich soil should be provided.

## VENTILATION

Plants grown under glass should be given as much air as possible while maintaining the required temperature; they should not of course be allowed to become chilled. This may be done by opening the frames early on bright sunny mornings and closing them in the afternoon before the sunlight is off the glass. Sash should always be opened on the side away from the direction in which the wind is blowing. On very bright warm days or during warm rains, the sash may be removed entirely. A stick notched so that the width of the opening may be suited to outside conditions is very useful in ventilating frames. If temperatures go low enough to freeze the plants, some protection, such as straw mats or old carpet, should be placed on the frames. During February, March, and April, such covering will have to be placed over the frames every night. As the weather becomes warmer, the frames should be ventilated more and more; and for several days before the plants are set in the garden, they may be left uncovered day and night.

## TRANSPLANTING

There is no set rule that can be followed in transplanting, because the kind of plants, the time desired to set them outdoors, and growing conditions in the house or under glass must all be considered. With most kinds, the first transplanting is made when the third leaf is well formed. If seedlings are allowed to crowd, they become spindling and rarely develop into good plants.

For transplanting, tin cans or berry boxes may be used as individual containers. With the cans, it is well to provide means of drainage by punching holes in the bottom. A thin layer of gravel or a few stones placed in the bottom of the can will prevent the soil from washing thru the holes. The soil should be kept moist, but not wet. Growing plants in boxes or cans insures a sturdy root development, and they may be transplanted to the garden with the ball of earth intact. Plants should be thoroly watered immediately after transplanting.

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144 How the plant produces seed
38 Principles and methods of plant breeding
129 Improving the corn crop by selection and breeding
44 Methods of breeding oats

THE SOIL

74 Introduction to the principles of soil fertility
42 Tilth and tillage of the soil
70 Soil moisture and crop production
78 Land drainage and soil efficiency
50 Nature, effects, and maintenance of humus in the soil
141 Farm manure: its production, conservation, and use

FARM CROPS

143 Potato growing in New York
66 Meadows in New York
90 Alfalfa for New York
110 Buckwheat
124 Field bean production
108 Culture of sweet clover and vetch

LIVESTOCK

137 The dairy herd
114 Silos, and the production and feeding of silage
131 Contagious abortion of cattle
136 The beef breeding herd in New York State
119 The curing of meat and meat products on the farm
134 Starting a flock of sheep
115 Keeping sheep for profit
139 Swine production in New York

DAIRYING

142 Calculating the cost of milk production
86 The production of clean milk
102 Cooling milk
82 Cream separation
32 Composition of milk and some of its products
60 Farm butter-making

98 Practical examples in dairy arithmetic
140 The Babcock test, and testing problems
135 The farm ice supply

FRUIT GROWING

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104 Pruning
84 Insects injurious to the fruit of the apple
123 Top-working and bridge-grafting fruit trees
72 Culture of the grape
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# THE CORNELL READING COURSE FOR THE FARM

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LESSON 145 VEGETABLE GARDENING SERIES MAY, 1919

# PLANNING THE HOME VEGETABLE GARDEN

# GROWING EARLY PLANTS

## DISCUSSION PAPER

The discussion paper takes the place of the teacher in encouraging thought and self-expression on important points in the lesson, and aims to assist the reader in reviewing and applying them. Each discussion paper filled out and returned is read carefully, and a personal reply is made to questions on any agricultural subject. In order to continue a course, the reader should sign and return the discussion paper so that another lesson may be sent. Questions are included on the discussion paper for the purpose of assisting those readers who desire to give the lesson special study. The preparation of answers is optional.

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(*Detach, sign, and return for the next lesson in this series.*)

*(In answering questions, attach additional paper if needed and number the answers.)*

1. What factors determine your garden plan — the available area, the condition of the soil, the size of the family, or climatic conditions?

2. Sketch your garden-planting plan, showing the location of crops, the hotbed, and the coldframe. Indicate the size of your garden.

3. List the vegetables and varieties you plan to raise next year, showing the number of feet of row for each.

4. In what ways will a hotbed and a coldframe lengthen the harvest season?

5. Is there any way in which you can increase the value of your garden? How?

6. Describe your method of growing early plants.

7. Sketch the cross section of a hotbed

8. Do you plant seed directly in the soil of the hotbed, or in boxes, or in pots?

9. Do you grow any crops to maturity in your hotbed or your cold-frame? If so, what crops? Describe how you do it, giving the date of planting and the date of harvesting.

10. Do you provide mats or other protection for the frames on cold nights?

11. Discuss watering and ventilating the hotbed and the coldframe.

Name.....

Address.....

Date.....

*(Address all correspondence to the Reading Course for the Farm, College of Agriculture, Ithaca, New York.)*